From the Editor

Hearing aids and cochlear implants are the two most widely used assistive technologies for people with hearing loss, and digital processing is now used extensively in both of these devices. Although it is less than a decade since the introduction of commercially viable digital hearing aids, 83% of the 2.1 million hearing aids sold in the United States in 2004 included digital technology (Strom, 2005). The transition period from analog to digital technology for hearing assistive devices is drawing to a close. It is becoming increasingly important for clinicians and all professionals involved in aural rehabilitation to learn more about the digital signal processing used in hearing aids and cochlear implants. This issue of *Trends in Amplification* is devoted to this topic.

A major challenge in designing hearing aids and cochlear implants is the need to convert the wide range of intensities of auditory signals at the input of the sensory aid into a more limited range at the output of the device. Amplitude compression is a widely used method of mapping a wider set of input levels into a more limited set of output levels, with the goal of ensuring audibility of low-level sounds and maintaining comfort of higher-level sounds. Amplitude compression has been used as a processing strategy in conventional hearing aids for many years. Multiband compression is also one of the most widely used signal processing strategies in digital hearing aids, alone or in combination with other types of signal processing.

There are many different ways to design a digital multiband compression hearing aid. In the first paper in this issue, James Kates provides an overview of the methods used to implement dynamic range compression in digital hearing aids. Kates focuses on the technical aspects of designing a digital compression hearing aid and also points out the relationship between signal processing approaches and perceptual consequences.

Digital technology has also made it possible to develop totally new signal processing strategies for hearing aids. In this issue and in upcoming issues of *Trends in Amplification,* we will be including papers that describe new approaches to amplification and provide an opportunity for our readers to learn about them. The second paper in this issue is by Peter Blamey and describes a new digital signal processing strategy that is proposed as an alternative to amplitude compression, called adaptive dynamic range optimization (ADRO). The signal processing strategy is now implemented in both hearing aids and cochlear implants. Blamey provides a description of this approach as well as information about possible fitting strategies. He also summarizes clinical evaluations of performance that use this type of processing.

About the authors:

- James Kates received the degrees of BSEE and MSEE from the Massachusetts Institute of Technology (MIT) in 1971 and the professional degree of electrical engineer from MIT in 1972. He is currently Senior Research Engineer in the Algorithm Development Group of GN ReSound, where he is involved in research and development of digital signal processing for hearing aids. He is also an Adjunct Professor in the Department of Speech Language and Hearing Sciences at University of Colorado in Boulder, where he teaches a course in hearing aid technology and conducts research in auditory perception, hearing loss, and signal processing for hearing aids. Before moving to Boulder, he was with the Center for Research in Speech and Hearing Sciences of the City University of New York, where he conducted research in hearing aids and auditory perception. He is the author or coauthor of 45 technical papers, 7 book chapters, and holds 14 United States patents with 7 patents pending.

- Peter Blamey is a Professorial Fellow of The University of Melbourne, and the Chief Technology Officer of Dynamic Hearing. During his 25-year association with the Department of Otolaryngology at The

University of Melbourne, Dr Blamey contributed to psychoacoustics, speech processing, and language development programs that shaped the multichannel cochlear implant now produced by Cochlear Limited. He is an author of over 100 peer-reviewed research articles on cochlear implants and hearing aids and an inventor on a dozen patent applications, including the ADRO sound processor.

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